

Application No. 09/893,316
Amendment dated
Reply to Office Action of September 9, 2005

Docket No.: 291958161US1

AMENDMENTS TO THE CLAIMS

1-53. (Cancelled)

54. (Previously Presented) A wafer processor for processing a wafer such as a semiconductor wafer, a magnetic disk, or an optical disk, comprising:

a processing bowl having an upper edge; and

a processor head comprising a motor and a wafer holder, the motor being carried above the wafer holder and operatively coupled to the wafer holder, the wafer holder being adapted to overlay a single wafer and support the single wafer about a periphery of the wafer with a process side of the wafer facing downward for rotation at a height below the upper edge of the processing bowl with the processor head extending outwardly of the periphery of the wafer.

55. (Previously Presented) The wafer processor of claim 54 wherein the processor head is adapted to be lifted with respect to the processing bowl.

56. (Previously Presented) The wafer processor of claim 54 wherein the wafer holder extends downwardly from an upper portion of the processor head to position a wafer below the upper portion of the processor head.

57. (Previously Presented) The wafer processor of claim 56 wherein the upper portion of the processor head extends outwardly of the periphery of the wafer.

58. (Previously Presented) The wafer processor of claim 56 wherein the upper portion of the processor head extends outwardly over the upper edge of the processing bowl.

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59. (Previously Presented) The wafer processor of claim 56 wherein the motor is carried by the upper portion of the processor head.

60. (Previously Presented) The wafer processor of claim 56 wherein the motor is enclosed within the upper portion of the processor head.

61. (Previously Presented) The wafer processor of claim 54 wherein the processor head comprises an annular gas-receiving recess having a height above a height of a front surface of any wafer carried by the wafer support.

62. (Previously Presented) The wafer processor of claim 54 wherein the wafer support comprises a wafer support plate.

63. (Previously Presented) The wafer processor of claim 62 wherein the processor head has an upper portion which extends outwardly beyond the wafer support plate.

64. (Previously Presented) The wafer processor of claim 54 wherein the wafer support comprises an acid-resistant material.

65. (Previously Presented) The wafer processor of claim 64 wherein the acid-resistant material comprises polyvinylidene fluoride.

66. (Previously Presented) The wafer processor of claim 54 wherein the wafer support comprises a wafer support plate having a downwardly directed front face and an upwardly directed back face.

67. (Previously Presented) The wafer processor of claim 66 wherein the wafer support plate carries a plurality of fingers adapted to engage a peripheral edge of a wafer.

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68. (Previously Presented) The wafer processor of claim 67 wherein the fingers peripherally support the wafer.

69. (Previously Presented) A wafer processor for processing a wafer such as a semiconductor wafer, a magnetic disk, or an optical disk, comprising:

a processing bowl having an upper edge; and

a processor head comprising an upper portion housing a motor, a rotatable wafer support carried below the upper portion, a vertical shaft coupling the motor to the wafer support, and a mount carried by the upper portion, the wafer support being adapted to overlay and peripherally support a single wafer at a height below the upper edge of the processing bowl, the mount being adapted to facilitate lifting of the processor head with respect to the processing bowl.

70. (Previously Presented) The wafer processor of claim 69 wherein the wafer holder extends downwardly from the upper portion of the processor head to position a wafer below the upper portion of the processor head.

71. (Previously Presented) The wafer processor of claim 69 wherein the upper portion of the processor head extends outwardly of the periphery of the wafer.

72. (Previously Presented) The wafer processor of claim 69 wherein the upper portion of the processor head extends outwardly over the upper edge of the processing bowl.

73. (Previously Presented) The wafer processor of claim 69 wherein the motor is enclosed within the upper portion of the processor head.

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74. (Previously Presented) The wafer processor of claim 69 wherein the processor head comprises an annular gas-receiving recess having a height above a height of a front surface of any wafer carried by the wafer support.

75. (Previously Presented) The wafer processor of claim 69 wherein the wafer support comprises a wafer support plate.

76. (Previously Presented) The wafer processor of claim 69 wherein the wafer support comprises an acid-resistant material.

77. (Previously Presented) The wafer processor of claim 76 wherein the acid-resistant material comprises polyvinylidene fluoride.

78. (Previously Presented) The wafer processor of claim 69 wherein the wafer support comprises a wafer support plate having a downwardly directed front face and an upwardly directed back face.

79. (Previously Presented) The wafer processor of claim 78 wherein the wafer support carries a plurality of fingers adapted to engage a peripheral edge of a wafer.

80. (Previously Presented) The wafer processor of claim 79 wherein the fingers peripherally support the wafer.

81. (Previously Presented) A wafer processor for processing a wafer such as a semiconductor wafer, a magnetic disk, or an optical disk, comprising:

a processing bowl having an upper edge; and

a processor head comprising an upper portion, a motor enclosed within the upper portion, and a wafer holder extending downwardly from the upper portion, the motor being coupled to the wafer holder by a downwardly extending shaft,

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the wafer holder being adapted to overlay and peripherally support a single wafer at a height below the upper edge of the processing bowl with the upper portion of the processor head extending outwardly of the periphery of the wafer.

82. (Previously Presented) The wafer processor of claim 81 wherein the processor head includes a mount adapted to facilitate lifting of the processor head.

83. (Previously Presented) The wafer processor of claim 81 wherein the upper portion of the processor head extends outwardly over the upper edge of the processing bowl.

84. (Previously Presented) The wafer processor of claim 81 wherein the processor head comprises an annular gas-receiving recess having a height above a height of a front surface of any wafer carried by the wafer support.

85. (Previously Presented) The wafer processor of claim 81 wherein the wafer support comprises a wafer support plate.

86. (Previously Presented) The wafer processor of claim 85 wherein the processor head has an upper portion which extends outwardly beyond the wafer support plate.

87. (Previously Presented) The wafer processor of claim 81 wherein the wafer support comprises an acid-resistant material.

88. (Previously Presented) The wafer processor of claim 87 wherein the acid-resistant material comprises polyvinylidene fluoride.

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89. (Previously Presented) The wafer processor of claim 81 wherein the wafer support comprises a wafer support plate having a downwardly directed front face and an upwardly directed back face.

90. (Previously Presented) The wafer processor of claim 89 wherein the wafer support plate carries a plurality of fingers adapted to engage a peripheral edge of a wafer.

91. (Previously Presented) The wafer processor of claim 90 wherein the fingers peripherally support the wafer.

92. (Previously Presented) A wafer processor for processing a wafer such as a semiconductor wafer, a magnetic disk, or an optical disk, comprising:

- a processing bowl having an upper edge; and

- a processor head comprising:

- a motor carried in an upper housing;

- a downwardly extending shaft coupled to the motor

- a wafer holder coupled to and extending downwardly from the shaft, the wafer holder being adapted to overlay and peripherally support a single wafer for rotation by the motor at a height below the upper edge of the processing bowl.

93. (Previously Presented) The wafer processor of claim 92 wherein the processor head includes a mount adapted to facilitate lifting of the processor head.

94. (Previously Presented) The wafer processor of claim 92 wherein the upper portion of the processor head extends radially outwardly over and around the upper edge of the processing bowl.

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95. (Previously Presented) The wafer processor of claim 92 wherein the processor head comprises an annular gas-receiving recess having a height above a height of a front surface of any wafer carried by the wafer support.

96. (Previously Presented) The wafer processor of claim 92 wherein the wafer support comprises a wafer support plate.

97. (Previously Presented) The wafer processor of claim 96 wherein the processor head has an upper portion which extends outwardly beyond the wafer support plate.

98. (Previously Presented) The wafer processor of claim 92 wherein the wafer support comprises an acid-resistant material.

99. (Previously Presented) The wafer processor of claim 98 wherein the acid-resistant material comprises polyvinylidene fluoride.

100. (Previously Presented) The wafer processor of claim 92 wherein the wafer support comprises a wafer support plate having a downwardly directed front face and an upwardly directed back face.

101. (Previously Presented) The wafer processor of claim 100 wherein the wafer support plate carries a plurality of fingers adapted to engage a peripheral edge of a wafer.

102. (Previously Presented) The wafer processor of claim 101 wherein the fingers peripherally support the wafer.

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103. (Withdrawn—Previously Presented) A method of handling a wafer, comprising:

- providing a wafer processor comprising a processing bowl and a processor head, the processing head including a wafer support;
- releasably engaging a periphery of a wafer with the wafer support;
- positioning the wafer at a height below an upper edge of the processing bowl with the wafer support extending downwardly from a location positioned above the upper edge of the processing bowl, the processing head overlying the wafer and supporting the periphery of the wafer to hold the wafer face down;
- rotating the wafer at the height below the upper edge of the processing bowl; and
- lifting the processing head.

104. (Previously Presented) An apparatus for handling a wafer, comprising:

- a processing head including a wafer support;
- a wafer processor comprising a processing bowl and a processor head;
- means for releasably engaging a periphery of a wafer with the wafer support;
- means for positioning the wafer at a height below an upper edge of the processing bowl with the wafer support extending downwardly from a location positioned above the upper edge of the processing bowl, the processing head overlying the wafer and supporting the periphery of the wafer to hold the wafer face down;
- means for rotating the wafer at the height below the upper edge of the processing bowl; and
- means for lifting the processing head.

105. (Previously Presented) The wafer processor of claim 92, further comprising:

- a spray processing vessel defined by the processing bowl;
- a spray-head mounted within the spray processing vessel for directing a spray of coating upon a single wafer being held face down by the wafer holder, the

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spray-head being moveable relative to the spray processing vessel and relative to the wafer holder to allow the spray-head to be directed to different areas of the wafer;

a gas conduit for delivering a carrier gas to the spray-head;

a coating conduit for delivering a coating material to the spray-head;

a coating metering pump for delivering a precise quantity of the coating material to the spray head; and

a coating viscosity control for controlling viscosity of the coating material applied by the spray-head.

106. (Previously Presented) The wafer processor of claim 92 wherein the processor head further comprises a wafer plate that overlays the wafer and a circular shroud over the motor.

107. (Previously Presented) The wafer processor of claim 92, further comprising:

gripping fingers arranged to engage the periphery of the wafer; and

actuator means to pivotally move the gripping fingers to engage/disengage the periphery of the wafer.

108. (Previously Presented) The wafer processor of claim 107 further comprising flexible support diaphragms sealingly engaged with corresponding gripping fingers.